

UNITED STATES
ATOMIC ENERGY COMMISSION

IN REPLY REFER TO:
ORB:CSS

Oak Ridge, Tennessee
April 20, 1959

2522 655
Kitter *CCW*
H. M. Roth

Union Carbide Nuclear Company
Post Office Box P
Oak Ridge, Tennessee

Attention: Mr. C. E. Center, Vice President

Subject: RELEASE OF RADIOACTIVITY TO THE ENVIRONS -- REQUEST BY AEC
HEADQUARTERS FOR INFORMATION

Gentlemen:

Reference is made to a telephone conversation on the above subject between Mr. R. C. Armstrong and Mr. Logan Emlet on April 7, 1959. A telephoned request earlier on the date of April 7 from the Director of Production called for information to be prepared on an urgent basis relative to the release of radioactivity, monitoring, data collection and reporting practices at all sites. Combined efforts of our staff with appropriate personnel of your installations and those of our other ORO contractors resulted in transmission of a unified statement on April 7 prior to a required deadline.

We enclose, for your retention and record, two sets of the combined statements forwarded for use in preparing information for the JCAE. These comprise Item 1, the request for information, and Parts I-IV, statements on each installation.

Your assistance, and the cooperation extended from throughout your applied health physics organization, is sincerely appreciated.

Very truly yours,

S. R. Sapirie
S. R. Sapirie
Manager
Oak Ridge Operations

Enclosure:
Statements (dup).

CC: R. C. Armstrong, ORO
C. A. Keller, ORO
J. W. Ruch, ORO
H. M. Roth, ORO

ChemRisk Document No. 2522

ORF01338

S. R. Sapirie, Manager, Oak Ridge Operations

Letter can
Ed
April 9, 1959
W. H. Hoff

R. C. Armstrong, Assistant Manager for Operations
Oak Ridge Operations

RELEASE OF RADIOACTIVITY TO THE ENVIRONMENT IN OAK RIDGE OPERATIONS -
REQUEST FOR INFORMATION ON MONITORING AND REPORT, APRIL 7, 1959

SYMBOL: ORB:CSS


Reference is made to the telephoned request to you, subject as above, from Mr. E. J. Bloch on April 7, 1959. Immediate information was required on (1) identification and degree of release to the environment of radioactive materials; (2) non-routine releases and their nature and history; (3) monitoring and monitoring practices at each facility, and (4) method, frequency and distribution of reported data. The enclosure marked Item 1 "Request for Information" details the information requested by the Director of Production.

Combined efforts on April 7, 1959, of the Production Division, Research and Development Division, Feed Materials Division, and the Classification Officer, plus work on the part of our contractor organizations, led to the development of information in 11 separate sections, each of these covering, as appropriate, the four major points of reference in the request made by the Director of Production. Beginning at about 4:30 PM on April 7, 1959, the collated information was transmitted by telephone from my office, following your review, to the Division of Production, Headquarters. The text of the information, in its eleven parts, as enclosed, represents our record of the transmission. Each of the responsible ORO Divisions and areas contributed its part to the collection of the enclosed information. Had more time been available it would have been possible to make the information more complete and with greater relation between installations reporting. As it is, however, we are of the opinion it will serve for immediate use, and can be utilized in some instances as guidance to reports and tabulated data transmitted previously to Headquarters, particularly with respect to the documents forwarded to the Division of Production at the time of the February 1959, hearings on Disposal of Radioactive Wastes.

R. C. Armstrong

Enclosures:

1. Request for Info.
2. Collated Info. Parts 1-4.

CC: C. A. Keller, w/Part 1 of encl. 
H. M. Roth, w/Part 2 of encl.
J. W. Rich, w/Part 3 of encl.
L. R. Michener, w/Part 4 of encl.

ITEM I

REQUEST FOR INFORMATION

Substance of information to be included in statement on each plant site on release of radioactivity to environs, as received from Mr. Bloch 4/7/59.

1. The first part of the statement would indicate the kinds of radioactive gases or substances that are released to the atmosphere, rivers, streams, and ground. Identify the radioactive substances, whether it is released routinely, the quantity of the release in relation to acceptable standards.
2. The second category would be substances which are released as the result of non-routine incidents. If these are non-routine releases several times per year, the statement should cover the year's experience. If there is one every several years, it would be necessary to go back several years and discuss the known instances.
3. Discuss the monitoring set-up and practices at each facility - what is monitored and why.
4. Discuss the collection and reporting of data on radioactive releases to the environs. This means what data is reported, what data is collected, the frequency at which it is collected, how it is reported and to whom it is reported. If it is classified, tell why it is classified. If it is unclassified, what is done with it and the extent to which it is made available publicly or released.

PART I

Y-12 PLANT

- (1) Operations at the Y-12 Plant which involve the processing, fabrication and machining of uranium metal and its compounds contribute both liquid and airborne effluents containing uranium to the environment.

The alpha activity of the liquid waste from the plant effluents is less than 6×10^{-4} uc/ml before dilution and less than 4.5×10^{-7} uc/ml after dilution in the East Fork of Poplar Creek which is entirely in the Oak Ridge Area. It should be noted that this stream joins another stream to form Poplar Creek which passes through the Oak Ridge Diffusion Plant Area and thence to the Clinch River. Thus water samples downstream of ORGDP reflect the contribution from both ORGDP and the Y-12 plant.

Atmospheric contaminants from the Y-12 Plant are uranium dusts and mists after filtration and air cleaning. Continuous air sampling has found the average level of uranium to be 5×10^{-13} uc/ml which compares with the NCRP value of 1.7×10^{-12} uc/cc for uncontrolled areas.

- (2) The nature of the Y-12 Plant operations is such that rarely, if ever, do accidental releases of radioactivity occur.
- (3) A comprehensive program of effluent sampling and monitoring for liquid and airborne contamination is carried out on both a spot check and general environmental basis. The radioactive monitoring program is specific for uranium and is intended to identify sources of contamination so that corrective action can be taken if necessary as well as to correlate the findings with the bioassay program of plant personnel. In addition, the environmental monitoring provides an indication of the effectiveness of plant control measures in the control of off plant pollution.
- (4) Air and water samples are collected and analyzed for uranium on a continuing routine basis. The data are furnished together with all other pertinent plant operating data and published quarterly in a classified report. The monitoring data per se are unclassified and have been made available to other groups when problems of mutual interest were under consideration. The data have not been made public or available through any routine channels since they are only meaningful when tied in with plant operations. In addition, to the best of our knowledge, no requests for information of this nature have been made.

OAK RIDGE GASEOUS DIFFUSION PLANT

- (1) Operations at the Oak Ridge Gaseous Diffusion Plant routinely release uranium to the environment in the form of uranium hexafluoride to the atmosphere, and uranium in the form of liquid waste from decontaminating process equipment. These quantities represent that fraction of material which cannot be recovered even with the most advanced and elaborate engineering techniques.

The alpha activity of the Clinch River, into which the plant liquid effluent drains is about 3.5×10^{-9} uc/ml, the range being about 2 to 5×10^{-9} uc/ml about one mile downstream. These values compare with 7×10^{-6} uc/ml recommended by the NCRP and an alpha background activity in the Clinch of 7×10^{-13} uc/cc.

Experience has indicated that about 2 lbs. of uranium per day in the form of UF_6 is released to the atmosphere in venting operations. The average concentration found at the plant perimeter fence, 5×10^{-13} uc/ml, is below the NCRP recommended value for uncontrolled areas which is 1.7×10^{-12} uc/ml.

- (2) The values provided under (1) also include various accidental releases of uranium hexafluoride which occur. These releases usually occur within the confines of a building, with the contamination limited to a small area, and these sources are not considered to contribute to any significant extent to the environment. While such releases are, of course, unpredictable, during 1958 the quantity involved amounted to about 100 lbs. of uranium.
- (3) A comprehensive program of effluent sampling and monitoring for liquid and airborne contamination is carried out on both a spot check and routine sampling basis. The radioactive monitoring program is specific for uranium and is intended to identify sources of contamination so that corrective action can be taken, if necessary, as well as to correlate the findings with the bioassay program of plant personnel. In addition, the environmental monitoring provides an indication of the effectiveness of plant control measures in the control of off plant pollution.
- (4) Air and water samples are collected and analyzed for uranium on a continuing routine basis. The data are furnished together with all other pertinent plant operating data and published quarterly in a classified report. The monitoring data per se are unclassified and have been made available to other groups such as TVA and Alcoa when problems of mutual interest were under consideration. The data have not been made public or available through any routine channels since they are only meaningful when tied in with plant operations.

PADUCAH GASEOUS DIFFUSION PLANT

- (1) Operational activities at Paducah are similar to those of the plants at Oak Ridge and Portsmouth.

Liquid effluents from Paducah are monitored in the Big and Little Bayou Creeks into which they drain, with the highest average value being 1.2×10^{-7} uc/ml as compared with the NCRP recommended limit of 7×10^{-6} uc/ml.

About 5 pounds of uranium per day has been discharged to the atmosphere as UF_6 in the past. Under these conditions the highest level of atmosphere contamination found was 1×10^{-13} uc/ml which compares with the NCRP limit of 1.7×10^{-12} uc/ml. While this quantity of discharge represents no hazard to health and insignificant atmospheric contamination, a more efficient absorber unit is being designed to reduce this uranium loss which is expected to reduce the discharge to about one pound per day.

- (2) The values provided under (1) also include various accidental releases of uranium hexafluoride which occur. These releases usually occur within the confines of a building, with the contamination limited to a small area, and these sources are not considered to contribute to any significant extent to the environment. Such releases are, of course, unpredictable and may range from a few pounds to larger quantities depending on the circumstances involved.
- (3) A comprehensive program of effluent sampling and monitoring for liquid and airborne contamination is carried out on both a spot check and general environmental basis. The radioactive monitoring program is specific for uranium and is intended to identify sources of contamination so that corrective action can be taken if necessary as well as to correlate the findings with the bioassay program of plant personnel. In addition, the environmental monitoring provides an indication of the effectiveness of plant control measures in the control of off plant pollution.
- (4) Air and water samples are collected and analyzed for uranium on a continuing routine basis. The data are furnished together with all other pertinent plant operating data and published quarterly in a classified report. The monitoring data per se are unclassified and are being made available to the Ohio River Valley Water Sanitation Commission on an annual basis. The data have not otherwise been made public or available through any routine channels since they are only meaningful when tied in with plant operations. In addition, to the best of our knowledge, no additional requests for information of this nature have been made.

PORTSMOUTH GASEOUS DIFFUSION PLANT

- (1) The only radioactive substances released from this plant both routinely and non-routinely are compounds of uranium and its associated daughter products. The specific uranium compounds are: UF_6 , UO_2F_2 and UF_4 in either gaseous, particulate or liquid forms. The levels found in water as it leaves the plant boundaries and in air external to the plant buildings have always been below the acceptable standards.

Water samples leaving the plant site are collected two or more times each month.

- (2) There has been no known large scale releases of water containing highly contaminated solutions. There were a total of 20 airborne releases of uranium compounds vented out of the exhaust stacks. No significant concentrations have been observed beyond one mile as detected on routine or special surveys.
- (3) Air samples are obtained at 44 locations on a monthly basis. These locations are external to the plant buildings and are both on and off plant sites. The monitoring program is set up for both chemical and radioactive substances. The monitoring program is set up to determine the effectiveness of control measures and operating efficiencies.
- (4) The results are tabulated on IBM records for future use and for specific purposes. The results are reported quarterly in the plant wide quarterly report. This report is classified due to other classified material contained in this report.

Results have been reported to the Ohio River Valley Water Sanitation Commission and are being reported to the Ohio Department of Health on a routine basis.

PART II.

OAK RIDGE NATIONAL LABORATORY

1. With reference to the Oak Ridge National Laboratory, a major portion of our comments will be found covered in detail in the document by K. Z. Morgan entitled "Waste Management Program at Oak Ridge National Laboratory" prepared for the February JCAE hearings. We transmitted to you a copy of this and other documents on February 5, 1959. If you wish we will forward additional copies.

ORNL releases Argon⁴¹, C¹⁴O₂, Xenon¹³⁴ and Krypton⁸⁵ and I-131, as mixed isotopes, mainly Xenon, Krypton, and Iodine, and Tritium and small quantities of S³⁵ to the atmosphere. To rivers, Cs-Ba¹³⁷, Sr⁹⁰, Cerium and Praesodymium¹⁴⁴, trivalent rare earths including Yttrium-90, and some Co⁶⁰. Some of the above isotopes go to the ground. In addition Ruthenium¹⁰⁶ traces of Uranium and transuranic elements including Pu²³⁹ Zr-Nb¹⁹⁵ and Rb¹⁰⁶ in very small barely detectable quantities are discharged to the ground in waste pits.

500 curies of Argon⁴¹ are liberated per day, but this short-life isotope is only the equilibrium quantity of 56 curies at any one time.

The air levels within the Laboratory are consistently less than 10% of the MPC set by the NCRP to which we adhere. Background measurements in the ORNL area are of the order of 4% of the MPL. There has been an increase in background in the neighborhood to about 1.7% of MPL based on occupational exposure limits or 17% based on limits set for non-occupational exposure. These values may be defined as the ambient radiation level from ground and air.

The levels of radioactivity in the Clinch River in relation to acceptable standards run in the order of 30% of the MPC value for potable waters in non-occupational areas, the trend being to a marked reduction in this value due to the low-level process water treatment plant. This level of 30% reaches a dilution factor of near 10x as the Tennessee River confluence. A total of 189 curies was released in 1957 including 18.0 curies of Strontium-90.

Low-level high-volume solid wastes are in the ORNL burial ground and are fixed. The four waste pits contain intermediate-level wastes added at the rate of 50,000 c/yr. This has released a total of 200 c Ru¹⁰⁶ to the ground in the overall period. Ru¹⁰⁶ moving through shales and soils with the nitrates serves as a tracer and is detected in monitoring wells.

OAK RIDGE NATIONAL LABORATORY (continued)

2. Non-routine releases have occurred. The first, in early operations detected in 1949 prior to establishment of air filtering was release of UO_2 particles with mixed fission products. Subsequent installation of reactor air filters resulted in the removal of such particles from the air. During the period of 1946-1956 occasional particulate releases occurred during RaLa operations, a situation which ended with cessation of this program at ORNL. In early 1958 one instance of a very small particulate release of Pa^{233} occurred due to faulty equipment, and this was essentially confined to the Laboratory area. No other instances have occurred in 1958 or to date in 1959.
3. At ORNL there are 10 local air monitors, 7 perimeter monitoring stations in the Oak Ridge area, and 4 monitoring stations at surrounding localities at distances up to 75 miles. Three more are being established. The area monitoring and monitoring stations enable ORNL to differentiate between local background and what has been contributed due to weapons' tests, and to enable action to be taken on an intelligent basis in event of an accident. The outlying stations are continuous sampling and recording stations. Up and down wind aerial monitoring is also accomplished. All liquid waste leaving ORNL is monitored and sampled on a continuous basis. The Clinch River is sampled daily and analyzed. Annual monitoring is carried out to a distance of 200 miles downstream.

Monitoring of liquid waste at the point of discharge is accomplished on a continuous basis, with a system for diverting the flow for further treatment if needed. White Oak Lake dam permits a holdup of 20 days under normal flow conditions.

4. No ORNL monitoring data is classified except Bluenose. All unclassified data is distributed to ORNL management for dissemination as internal central files documents. Summarizations of data are provided in ORNL Health Physics Division annual reports which are unclassified.

All information on releases to the environment and monitoring data appear as monthly central files documents. All data is reported on the above types of monitoring. Data is collected continuously except the annual river survey, monthly aerial survey, and the monthly ambient background survey. It is reported departmentally on a monthly basis, and internally within the laboratory on a monthly, quarterly or semi-annually basis, up to 1957. The FY 1959 report, covering all monitoring

OAK RIDGE NATIONAL LABORATORY (continued)

activities, with comments, is now in process of being edited as an unclassified ORNL document for TID-4500 distribution and for sale. Water and air data summaries for FY 1958 will be found in unclassified ORNL-2590 on sale by the Office of Technical Services. The annual reports containing summaries are on TID-4500 distribution.

OAK RIDGE INSTITUTE OF NUCLEAR STUDIES

The ORINS releases about 1 microcurie per month of Na-24 in permissible concentrations to sanitary sewers. The average concentration in sewers is negligible. About 1 millicurie of radioactive gold is released to a surface stream once quarterly during a controlled and monitored training experiment. No reports are made regarding ORINS releases.

UNIVERSITY OF TENNESSEE-AEC AGRICULTURAL RESEARCH LABORATORY

The UT-AEC Laboratory has released a total of less than 5 millicuries of Carbon-14 and Calcium-45 to the environment over a period of four to five years. This insignificant routine release is neither monitored nor reported.

PUERTO RICO NUCLEAR CENTER

Based upon isotopes' allocation and the similarity of the PRNC program to that of ORINS, it is estimated that less than 20 millicuries of Iodine-131 and other isotopes of medical use are discharged to the sanitary sewers per month. The average concentrations are negligible and are not reported.



INTERNAL CORRESPONDENCE

NUCLEAR DIVISION

POST OFFICE BOX P, OAK RIDGE, TENNESSEE 37831

To (Name):	ORGDP Nuclear Safety Committee:	Date	February 17, 1964
Company	J. W. Arendt R. L. Macklin	Originating Dept.	
Location	K. W. Bahler A. J. Mallett - RC	Answering letter date	
	R. M. Batch J. A. Marshall		
	A. D. Callihan C. E. Newlon		
	A. P. Huber R. L. Newton		
Copy to	K. M. Jones J. A. Parsons	Subject	Cylinder Disposal Program
	R. G. Jordan J. B. Scott		
	D. M. Lang R. A. Walker		

K-D-1812

Copy To: J. P. Murray
 ORGDP (J. C. Barton - A. F. Becher -
 H. J. Culbert - S. S. Stief)
 Paducah (R. A. Winkel - R. C. Baker)
 Y-12 (R. F. Hibbs - J. D. McLendon)
 GAT (G. H. Reynolds - F. E. Woltz)

RECEIVED
 NOT TO BE LOANED FROM
 PLANT RECORDS

It is proposed by the Coded Chemicals and Safety and Health Physics Department to dispose of a number of cylinders which contain UF₆ in quantities and enrichments not considered economically recoverable, or which present a serious hazard to personnel because of the hydrocarbon or halogen content.¹ The contents of the cylinders will be emptied into a pond, west of K-33, which empties into the Clinch River. The initial group for disposal comprises 74 cylinders containing 32,861 g. of uranium and 435 g. of U-235 at enrichments from 0.548% to 5.39%. Later disposal will involve batches of 1 to 15 cylinders at higher enrichments.

Equipment and Operation

Over 2 million gallons of water are contained in the pond; and a weir, between the pond and the river, will be utilized to control the water depth until conditions of river flow are such as to permit release of the uranium-bearing water. Specified contamination control levels which are considered safe by the National Committee on Radiation Protection will be met.

¹Becher, A. F., Nuclear Safety Approval for Cylinder Disposal, September 16, 1963.

An access road will be built from the K-33 parking area to the pond, and a 10' x 20' dock will be constructed and equipped with a hoist and cradle for handling 5" to 12" I.D. cylinders. A compressor will be installed to furnish air to remove defective cylinder valves under water. Where this is not possible the cylinders will be positioned at the dock, punctured with rifle fire, and then lowered into the water by remote control. A forced water stream will be used to agitate the pond water for prompt mixing of the released materials.

Nuclear Safety

The proposed disposal of this group of cylinders appears safe, based on data submitted and outlined in Table I. However, containers other than those listed will not be disposed of at this time since additional assurance is needed that agitation of the water by a separate, forced water stream will prevent an unsafe configuration from the released uranium. Thus, data on the distribution of uranium in the water and the mud will be taken and evaluated prior to other disposal operations.

The assay ranges, number of cylinders per range in the initial batch, and uranium contents are listed below. The data were obtained from IBM records of cylinder numbers, weights, and laboratory analysis data.

TABLE I

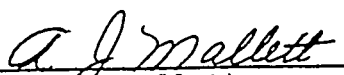
<u>U-235 Range</u>	<u>Cylinders</u>	<u>Total Amount of Uranium</u>	<u>Total Amount of U-235</u>
1.0%	42	24,618	171
1.0 - 1.6%	21	3,688	45
1.6 - 3.0%	5	265	7
3.0 - 3.7%	1	27	1
3.7 - 5.39%	<u>5</u>	<u>4,263</u>	<u>229</u>
Totals	74	32,861	453

The procedure used by the laboratory in analyzing the highly contaminated samples included gas phase hydrolysis of each sample, with subsequent purification and electroplating for fission counting of the U-235 content. The estimated error in results obtained is considered by laboratory supervision to be within 2.0%. Since the per cent U-235 is applied to the net weight of a cylinder, considered as all UF₆, the resulting values given in

Table I are thus conservative. Additionally, the total U-235 content indicated is approximately 60% of the safe mass for the maximum enrichment of this group of cylinders.²

Conclusion

The disposal of the contents of the cylinders listed in Table I, as outlined above, appears safe.


A. J. Mallett
Nuclear Safety Department

AJM:pjt

²Henry, H. F., et al, Criticality Data and Nuclear Safety Guide Applicable to the Oak Ridge Gaseous Diffusion Plant, May 22, 1959 (K-1019, Fifth Revision).